FIG.1

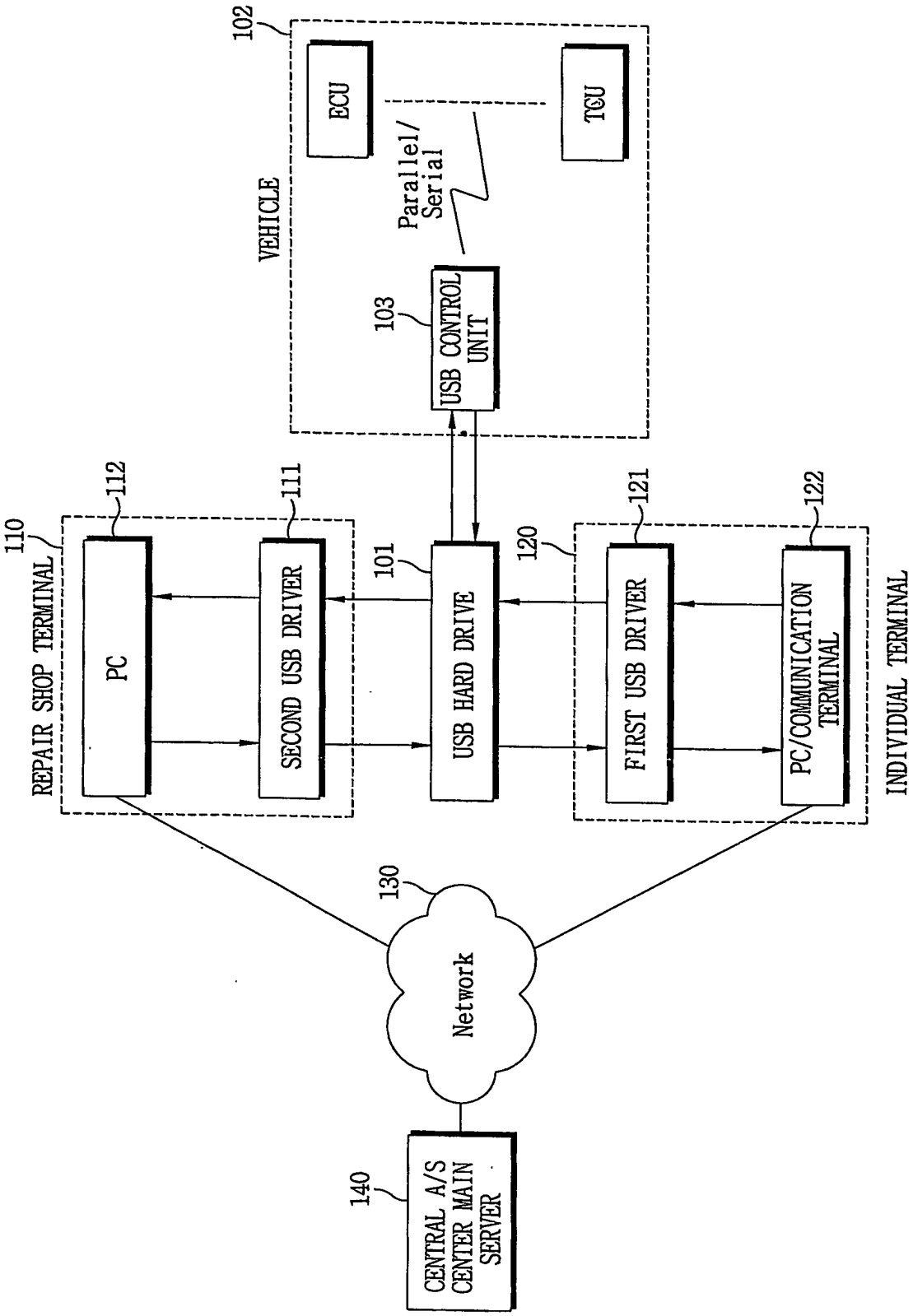

102
ECU
TCU
VEHICLE
Parallel/
Serial
103
USB CONTROL
UNIT
112
111
110
101
120
121
122
REPAIR SHOP TERMINAL
PC
SECOND USB DRIVER
USB HARD DRIVE
FIRST USB DRIVER
PC/COMMUNICATION
TERMINAL
INDIVIDUAL TERMINAL
130
Network
140
CENTRAL A/S
CENTER MAIN
SERVER

FIG.2

INFORMATION STRUCTURE STORED IN USB HARD DRIVE

<table>
<tr><td rowspan="2">BASIC VEHICLE INFORMATION DATA</td><td>UNCHANGEABLE ITEMS</td></tr>
<tr><td>UPDATABLE ITEMS</td></tr>
<tr><td rowspan="2">VEHICLE MAINTENANCE INFORMATION DATA</td><td>UPDATE ITEMS FROM USB CONTROL UNIT</td></tr>
<tr><td>UPDATE ITEMS FROM EXTERNAL DEVICES</td></tr>
<tr><td colspan="2">DRIVER'S CONVENIENCE INFORMATION DATA</td></tr>
<tr><td colspan="2">JOINT APPLICATION INFORMATION DATA</td></tr>
<tr><td colspan="2">OTHER INFORMATION DATA</td></tr>
</table>

INFORMATION STRUCTURE STORED IN USB CONTROL UNIT

<table>
<tr><td rowspan="2">BASIC VEHICLE INFORMATION DATA</td><td>UNCHANGEABLE ITEMS</td></tr>
<tr><td></td></tr>
<tr><td rowspan="2">VEHICLE MAINTENANCE INFORMATION DATA</td><td>UPDATE ITEMS FROM VARIOUS CONTROL UNIT</td></tr>
<tr><td>UPDATE ITEMS FROM THE USB HARD DRIVE</td></tr>
<tr><td colspan="2">DRIVER'S CONVENIENCE INFORMATION DATA</td></tr>
<tr><td colspan="2"></td></tr>
<tr><td colspan="2">OTHER INFORMATION DATA</td></tr>
</table>

FIG.3

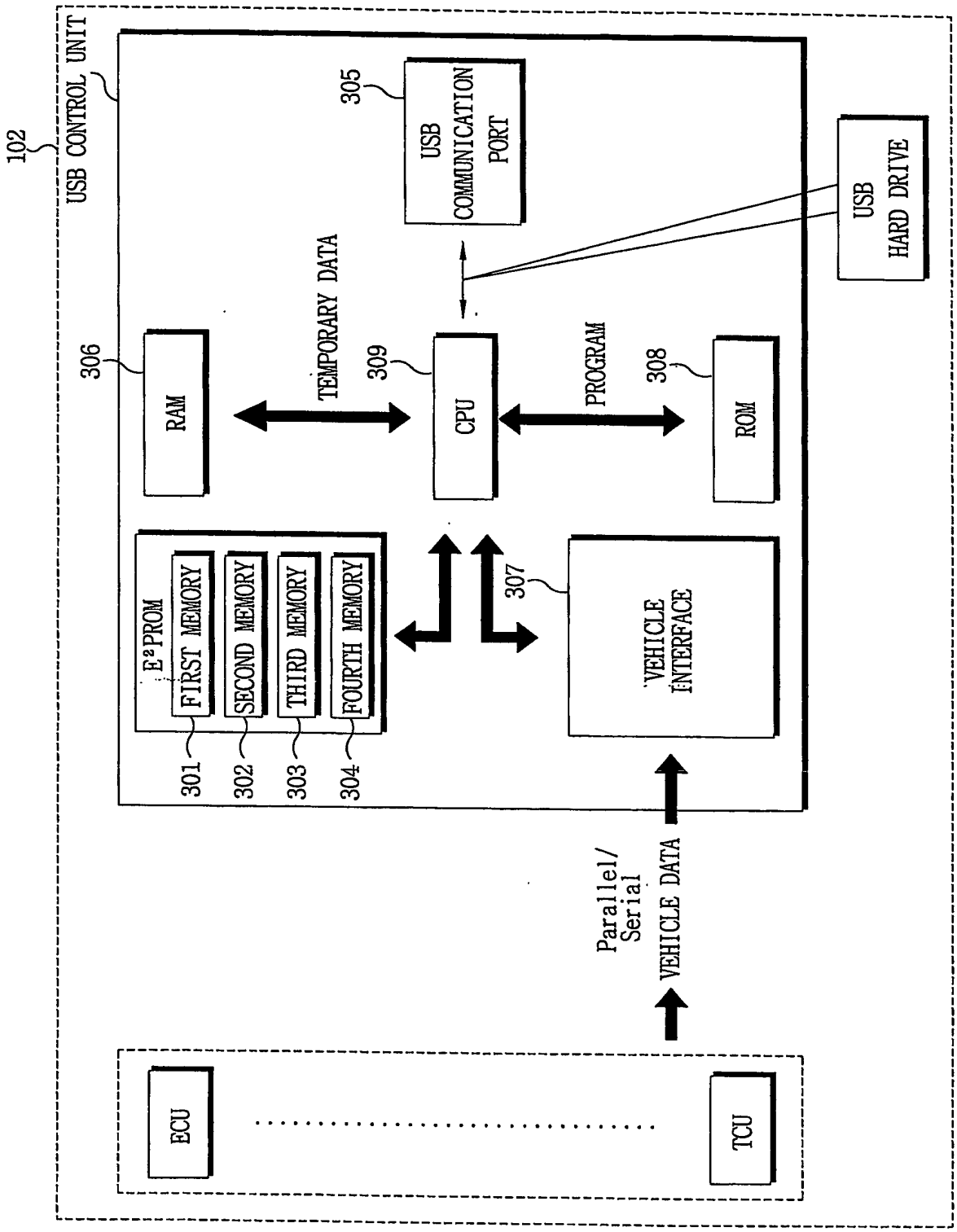

102
USB CONTROL UNIT
305
USB COMMUNICATION PORT
USB HARD DRIVE
TEMPORARY DATA
306
RAM
309
CPU
PROGRAM
308
ROM
E²PROM
FIRST MEMORY
SECOND MEMORY
THIRD MEMORY
FOURTH MEMORY
307
VEHICLE INTERFACE
301
302
303
304
Parallel/ Serial
VEHICLE DATA
ECU
TCU

FIG.4

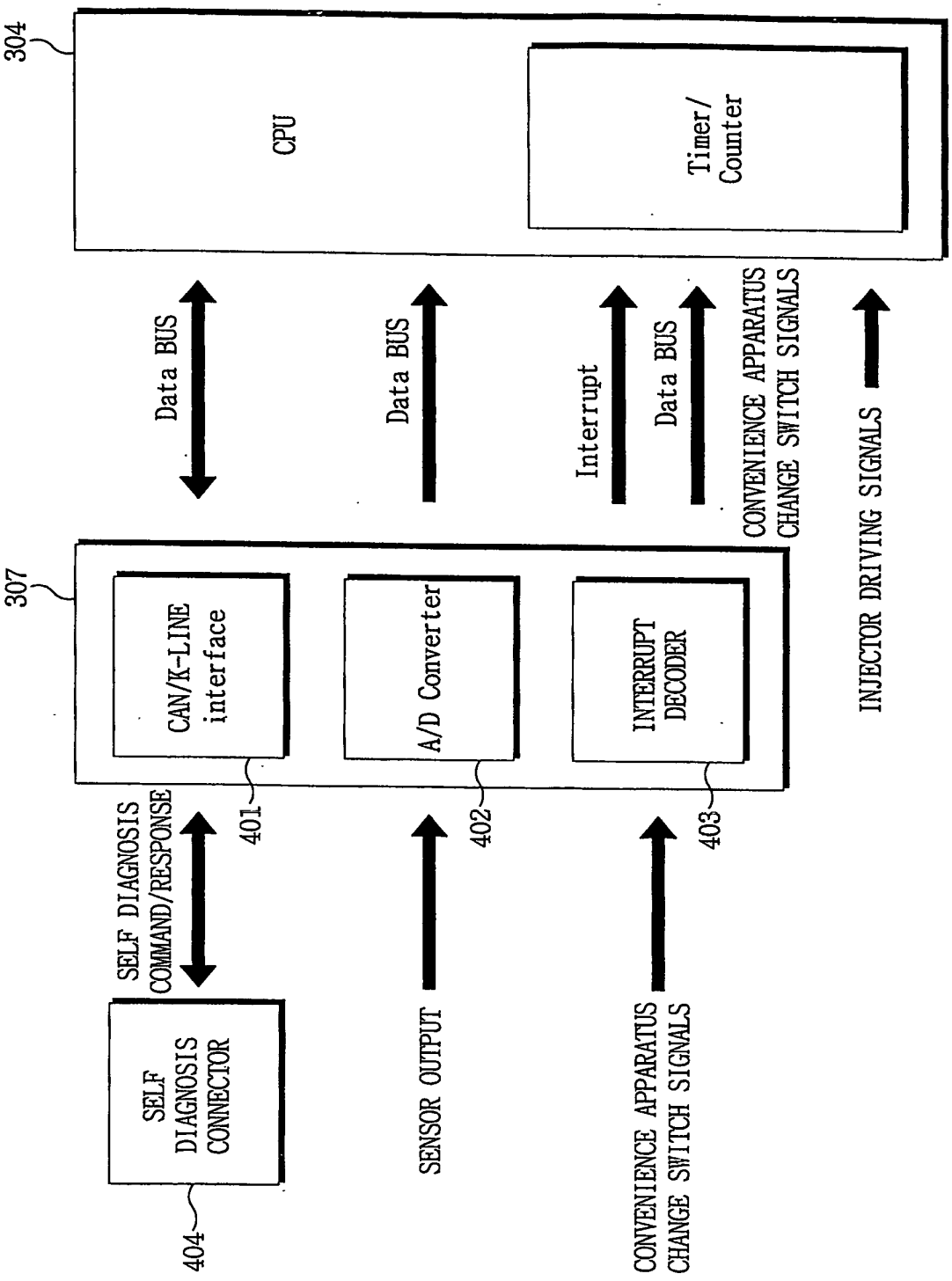

304
CPU
Timer/
Counter
Data BUS
Data BUS
Interrupt
Data BUS
CONVENIENCE APPARATUS
CHANGE SWITCH SIGNALS
INJECTOR DRIVING SIGNALS
307
CAN/K-LINE
interface
A/D Converter
INTERRUPT
DECODER
SELF DIAGNOSIS
COMMAND/RESPONSE
401
402
403
SELF
DIAGNOSIS
CONNECTOR
404
SENSOR OUTPUT
CONVENIENCE APPARATUS
CHANGE SWITCH SIGNALS

FIG.5

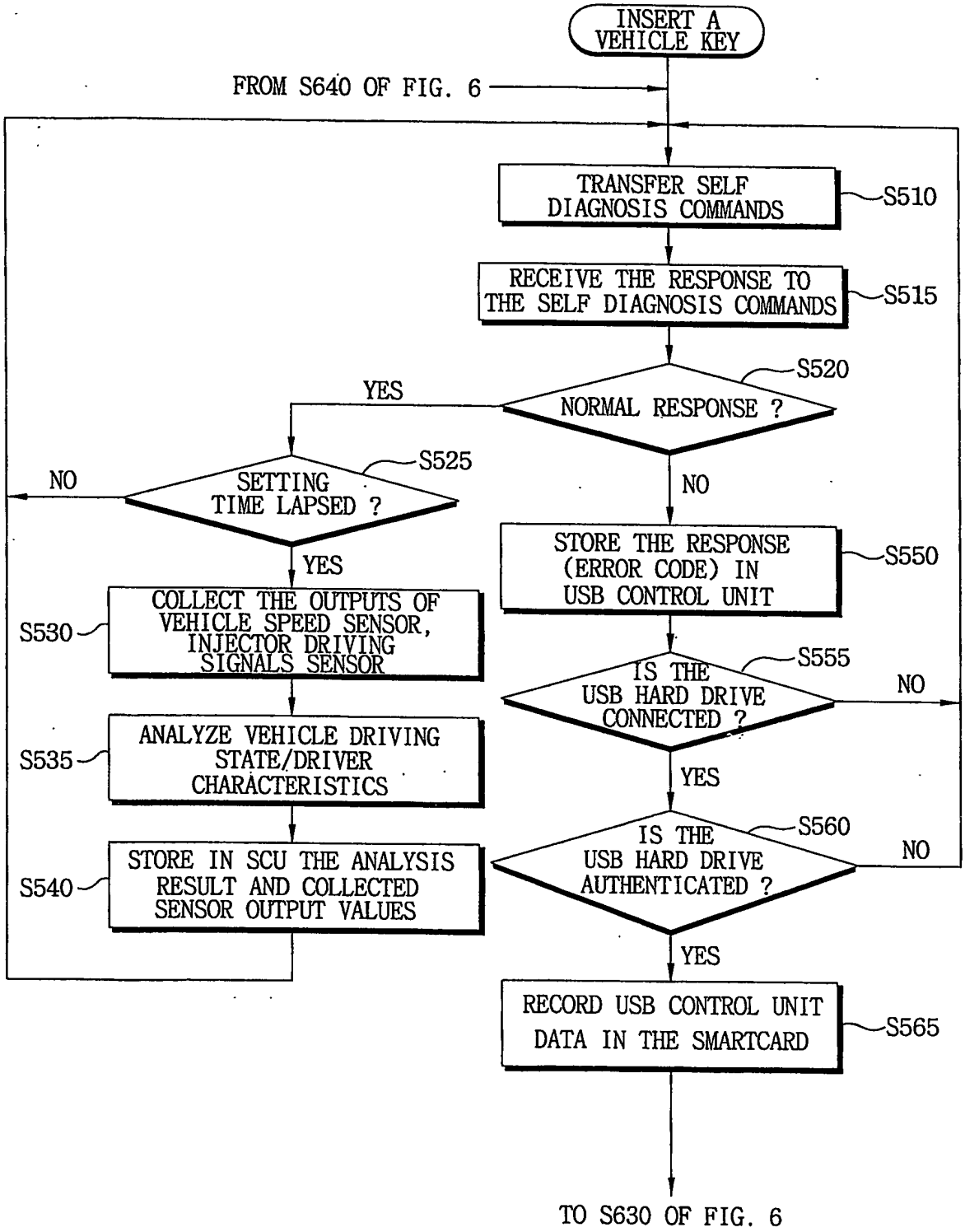

INSERT A VEHICLE KEY
FROM S640 OF FIG. 6
TRANSFER SELF DIAGNOSIS COMMANDS
S510
RECEIVE THE RESPONSE TO THE SELF DIAGNOSIS COMMANDS
S515
S520
NORMAL RESPONSE ?
YES
NO
S525
SETTING TIME LAPSED ?
NO
YES
S530
COLLECT THE OUTPUTS OF VEHICLE SPEED SENSOR, INJECTOR DRIVING SIGNALS SENSOR
S535
ANALYZE VEHICLE DRIVING STATE/DRIVER CHARACTERISTICS
S540
STORE IN SCU THE ANALYSIS RESULT AND COLLECTED SENSOR OUTPUT VALUES
STORE THE RESPONSE (ERROR CODE) IN USB CONTROL UNIT
S550
S555
IS THE USB HARD DRIVE CONNECTED ?
NO
YES
S560
IS THE USB HARD DRIVE AUTHENTICATED ?
NO
YES
RECORD USB CONTROL UNIT DATA IN THE SMARTCARD
S565
TO S630 OF FIG. 6

FIG.6

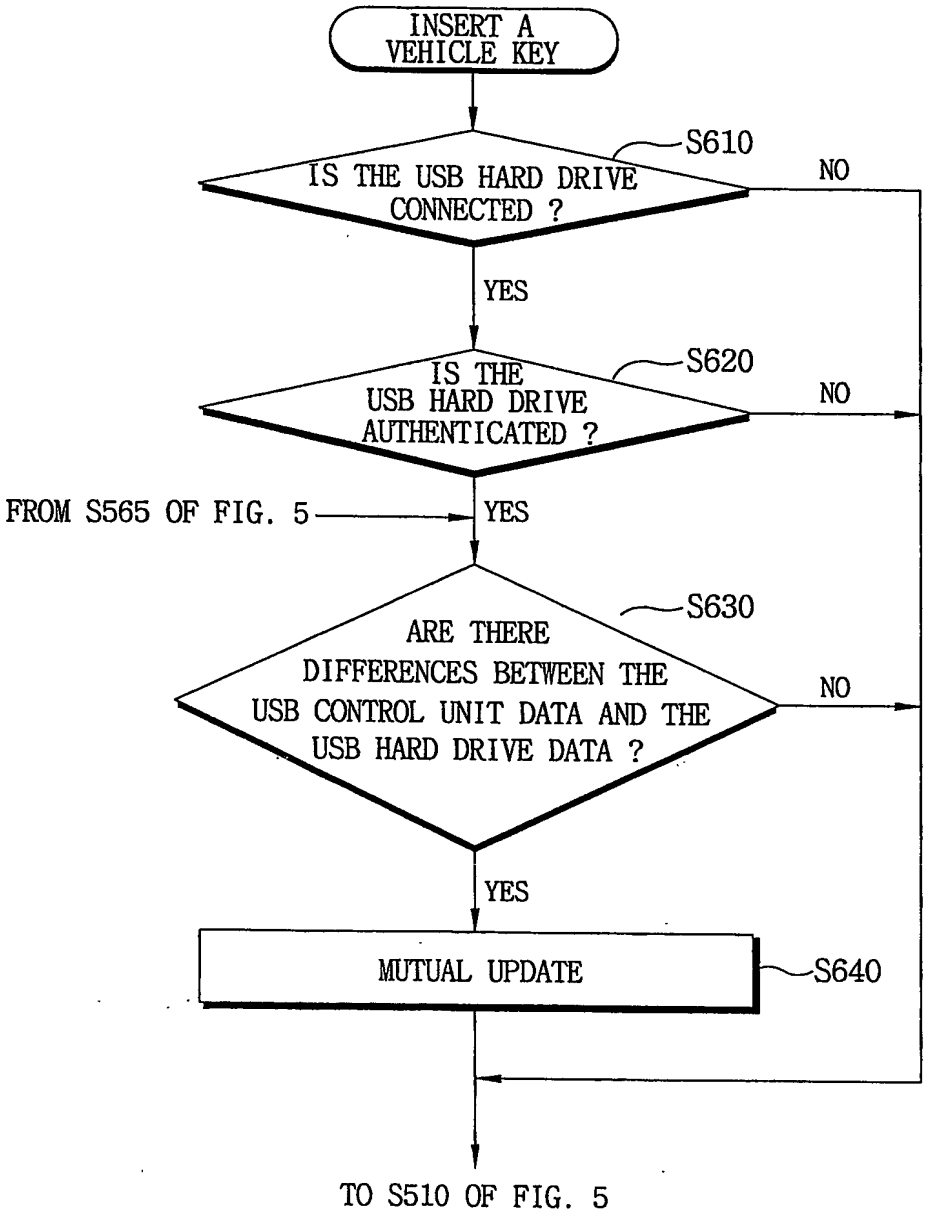

INSERT A VEHICLE KEY
S610
IS THE USB HARD DRIVE CONNECTED ?
NO
YES
S620
IS THE USB HARD DRIVE AUTHENTICATED ?
NO
FROM S565 OF FIG. 5
YES
S630
ARE THERE DIFFERENCES BETWEEN THE USB CONTROL UNIT DATA AND THE USB HARD DRIVE DATA ?
NO
YES
MUTUAL UPDATE
S640
TO S510 OF FIG. 5

FIG.7

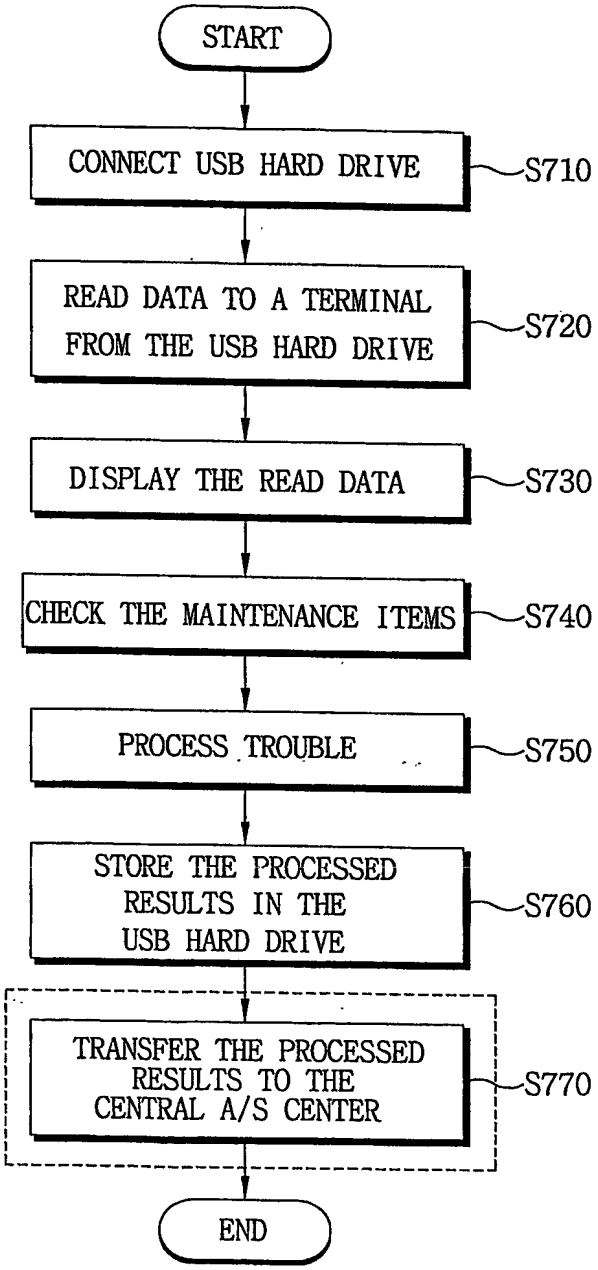

START
CONNECT USB HARD DRIVE
S710
READ DATA TO A TERMINAL FROM THE USB HARD DRIVE
S720
DISPLAY THE READ DATA
S730
CHECK THE MAINTENANCE ITEMS
S740
PROCESS TROUBLE
S750
STORE THE PROCESSED RESULTS IN THE USB HARD DRIVE
S760
TRANSFER THE PROCESSED RESULTS TO THE CENTRAL A/S CENTER
S770
END

FIG.8

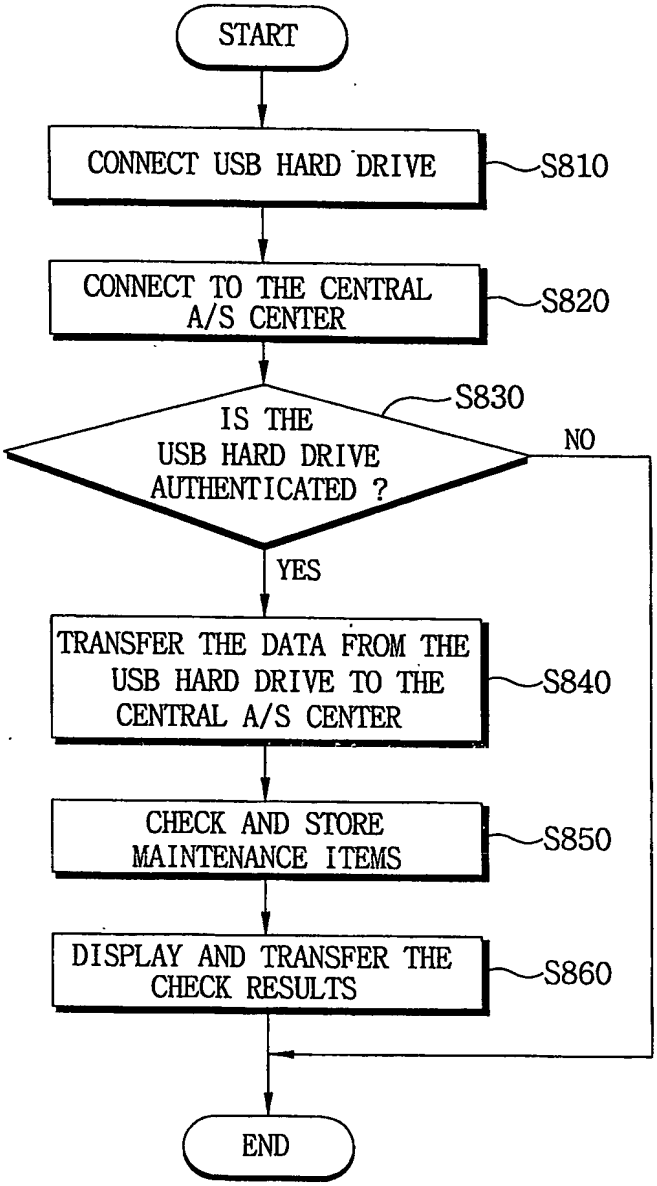

START
CONNECT USB HARD DRIVE
S810
CONNECT TO THE CENTRAL A/S CENTER
S820
IS THE USB HARD DRIVE AUTHENTICATED ?
S830
NO
YES
TRANSFER THE DATA FROM THE USB HARD DRIVE TO THE CENTRAL A/S CENTER
S840
CHECK AND STORE MAINTENANCE ITEMS
S850
DISPLAY AND TRANSFER THE CHECK RESULTS
S860
END

FIG.9

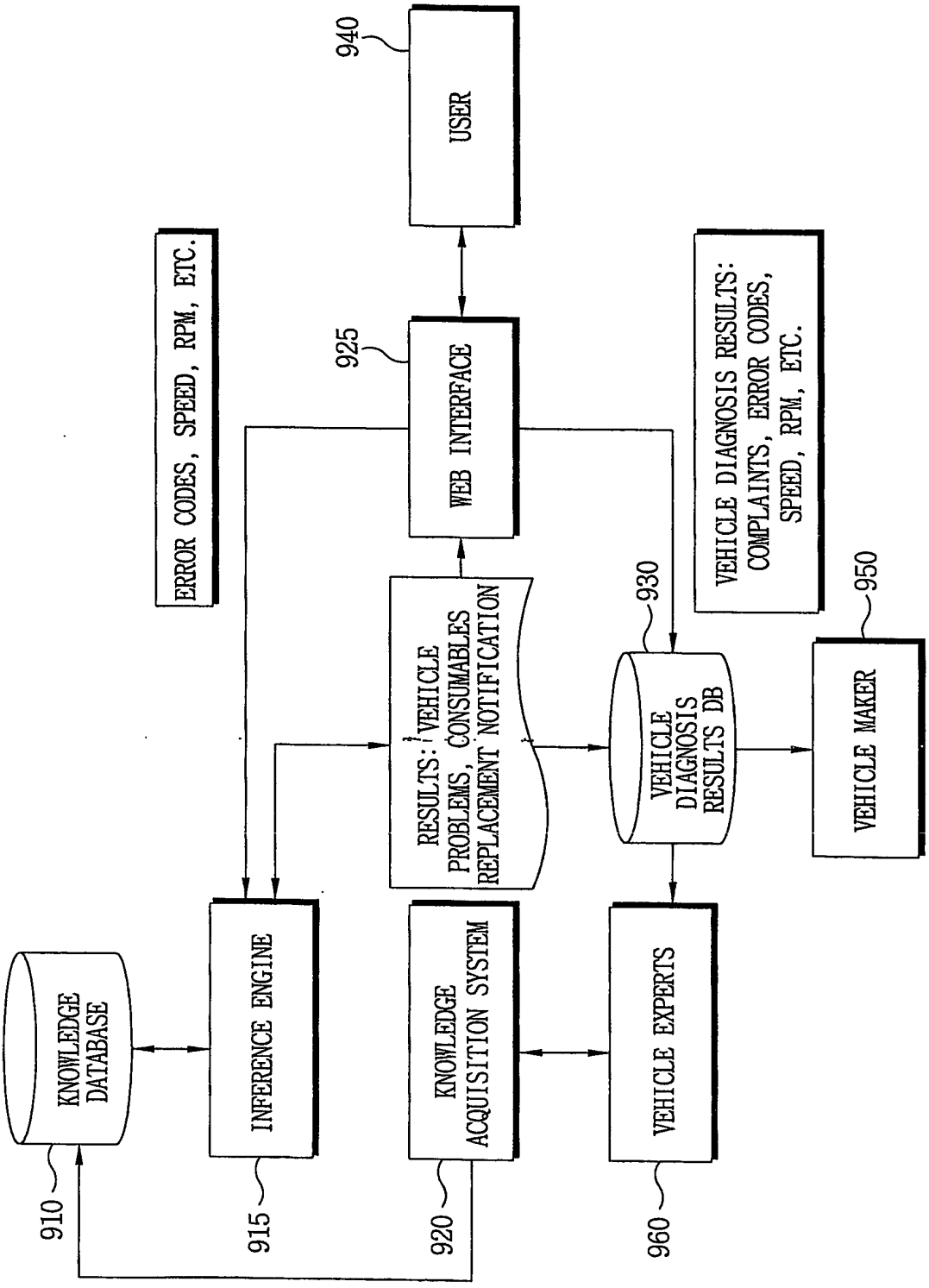

940
USER
925
WEB INTERFACE
ERROR CODES, SPEED, RPM, ETC.
VEHICLE DIAGNOSIS RESULTS: COMPLAINTS, ERROR CODES, SPEED, RPM, ETC.
RESULTS: VEHICLE PROBLEMS, CONSUMABLES REPLACEMENT NOTIFICATION
930
VEHICLE DIAGNOSIS RESULTS DB
950
VEHICLE MAKER
KNOWLEDGE DATABASE
INFERENCE ENGINE
KNOWLEDGE ACQUISITION SYSTEM
VEHICLE EXPERTS
910
915
920
960

FIG. 10

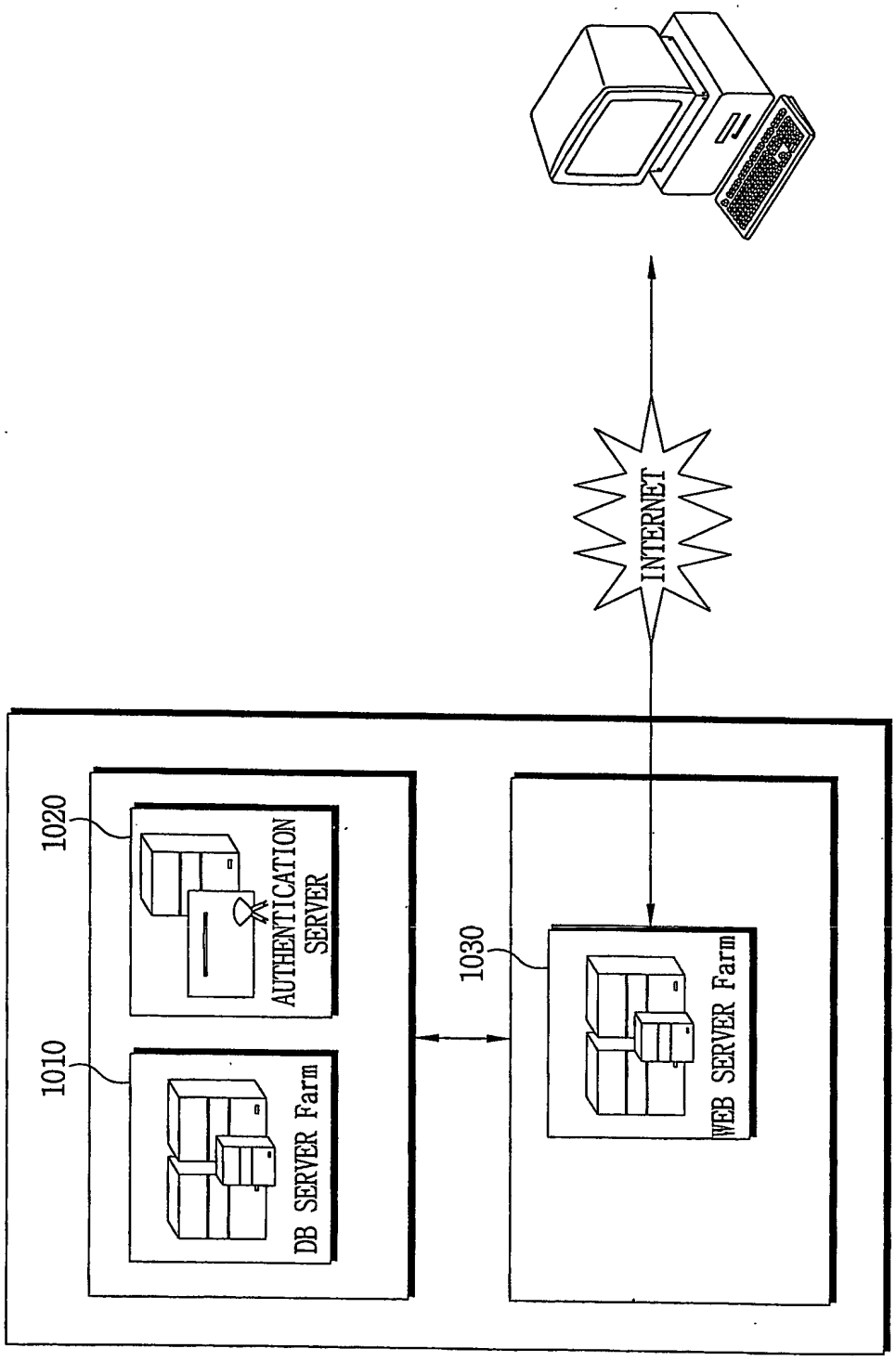

INTERNET
1020
AUTHENTICATION SERVER
1010
DB SERVER Farm
1030
WEB SERVER Farm

FIG.11

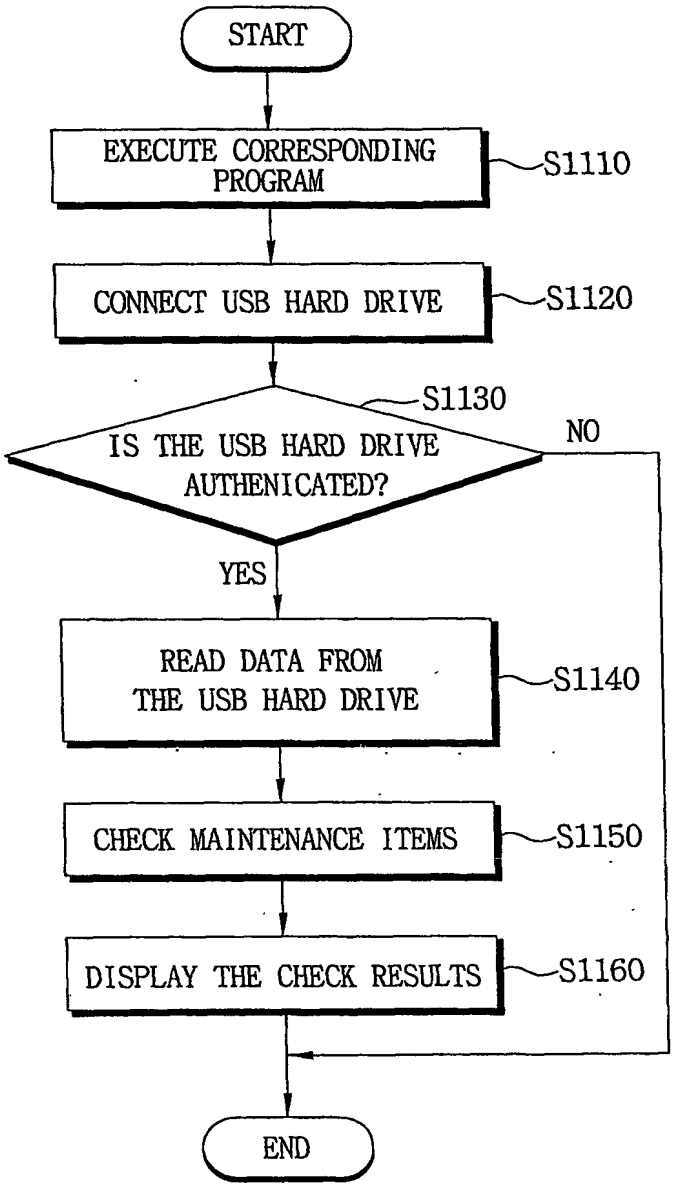

START
EXECUTE CORRESPONDING PROGRAM
S1110
CONNECT USB HARD DRIVE
S1120
S1130
IS THE USB HARD DRIVE AUTHENICATED?
NO
YES
READ DATA FROM THE USB HARD DRIVE
S1140
CHECK MAINTENANCE ITEMS
S1150
DISPLAY THE CHECK RESULTS
S1160
END

FIG. 12

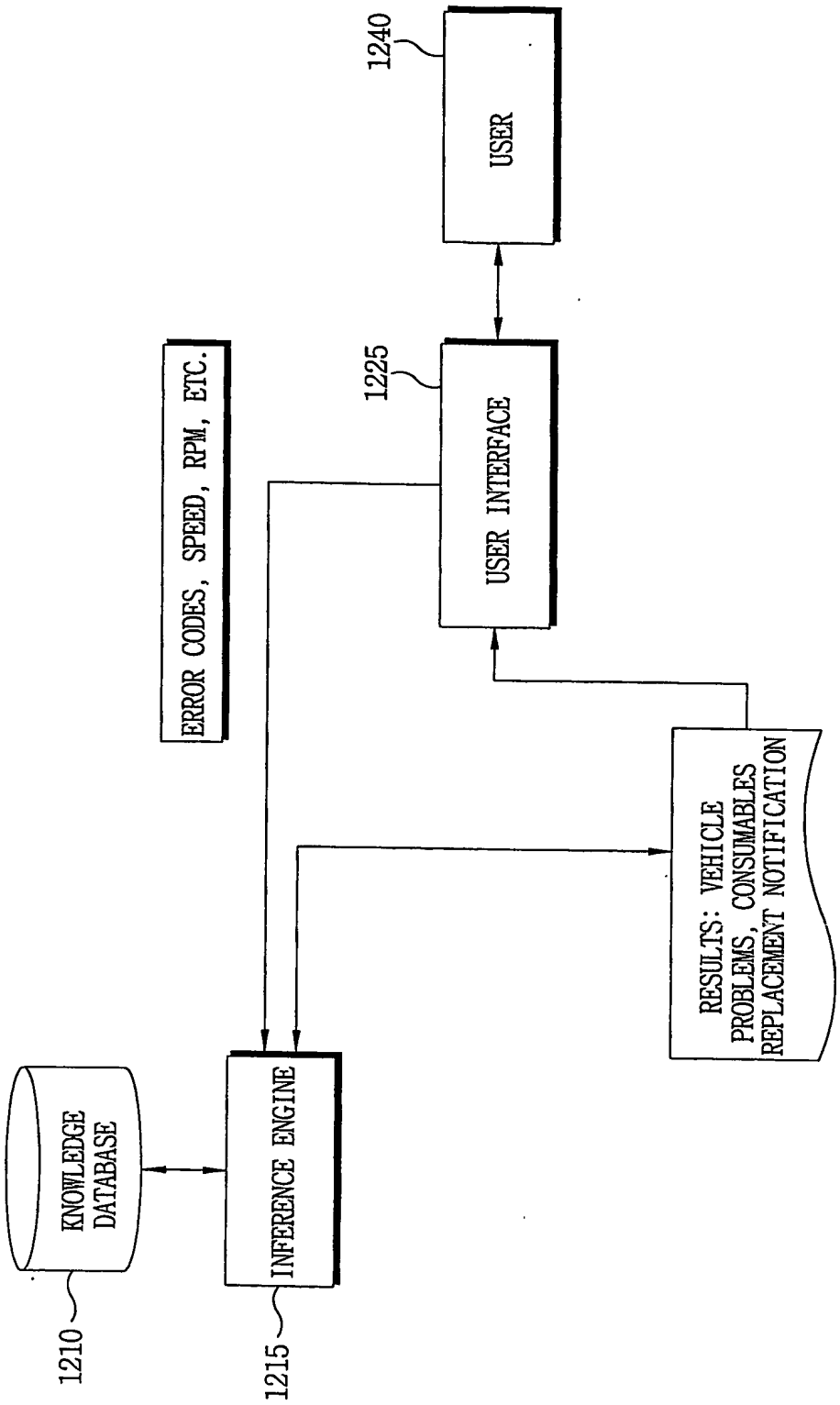

1240
USER
1225
USER INTERFACE
ERROR CODES, SPEED, RPM, ETC.
RESULTS: VEHICLE PROBLEMS, CONSUMABLES REPLACEMENT NOTIFICATION
KNOWLEDGE DATABASE
INFERENCE ENGINE
1210
1215

FIG. 13a

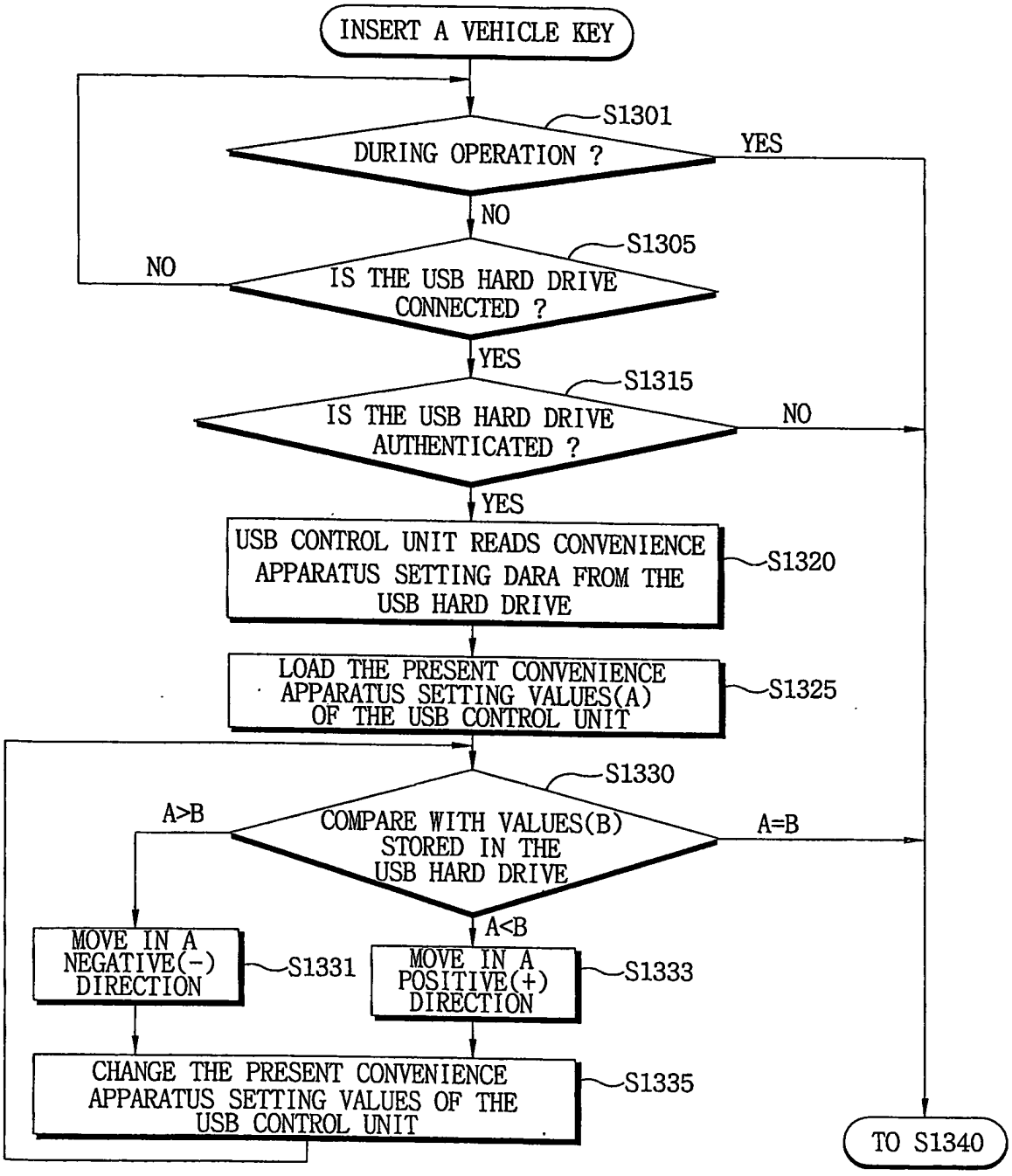
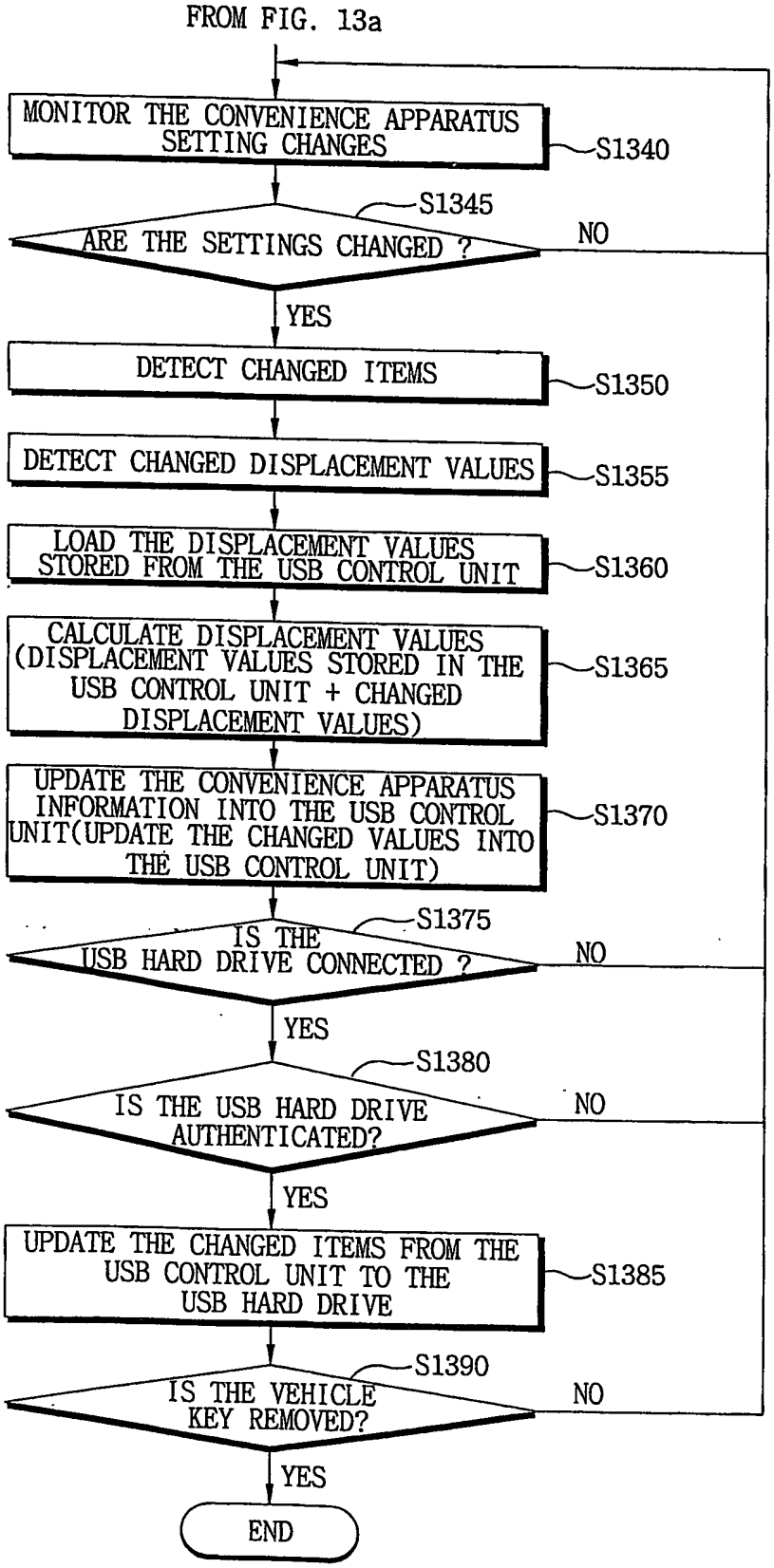

INSERT A VEHICLE KEY
S1301
DURING OPERATION ?
YES
NO
S1305
IS THE USB HARD DRIVE CONNECTED ?
NO
YES
S1315
IS THE USB HARD DRIVE AUTHENTICATED ?
NO
YES
USB CONTROL UNIT READS CONVENIENCE APPARATUS SETTING DARA FROM THE USB HARD DRIVE
S1320
LOAD THE PRESENT CONVENIENCE APPARATUS SETTING VALUES(A) OF THE USB CONTROL UNIT
S1325
S1330
COMPARE WITH VALUES(B) STORED IN THE USB HARD DRIVE
A>B
A=B
A<B
MOVE IN A NEGATIVE(-) DIRECTION
S1331
MOVE IN A POSITIVE(+) DIRECTION
S1333
CHANGE THE PRESENT CONVENIENCE APPARATUS SETTING VALUES OF THE USB CONTROL UNIT
S1335
TO S1340

FIG. 13b


FROM FIG. 13a
MONITOR THE CONVENIENCE APPARATUS SETTING CHANGES
S1340
S1345
ARE THE SETTINGS CHANGED ?
NO
YES
DETECT CHANGED ITEMS
S1350
DETECT CHANGED DISPLACEMENT VALUES
S1355
LOAD THE DISPLACEMENT VALUES STORED FROM THE USB CONTROL UNIT
S1360
CALCULATE DISPLACEMENT VALUES (DISPLACEMENT VALUES STORED IN THE USB CONTROL UNIT + CHANGED DISPLACEMENT VALUES)
S1365
UPDATE THE CONVENIENCE APPARATUS INFORMATION INTO THE USB CONTROL UNIT(UPDATE THE CHANGED VALUES INTO THE USB CONTROL UNIT)
S1370
S1375
IS THE USB HARD DRIVE CONNECTED ?
NO
YES
S1380
IS THE USB HARD DRIVE AUTHENTICATED?
NO
YES
UPDATE THE CHANGED ITEMS FROM THE USB CONTROL UNIT TO THE USB HARD DRIVE
S1385
S1390
IS THE VEHICLE KEY REMOVED?
NO
YES
END